regions are divided by deep sea and by coast-lines, which, as the eastern and southern coasts of India, do not afford the necessary conditions for the development of corals, whilst the extension to the east is much facilitated by low grounds and favourable coast-lines. Nevertheless, however different as to the species which inhabit them, both regions have a close likeness as to certain species, and both might be considered as having formed a single region, probably at the time when the great plateau of the Sunda Islands was a continuation of the continent, and when Madagascar and Ceylon were in close connection. As to the inhabitants of greater depths and of colder water—as the Gorgonids, the Anthozoæ, and the Primnoids—the same species are widely spread throughout the Pacific and the Indian Ocean, showing thus that the differentiation of shallow-water forms goes on more rapidly than that of the deep-water ones.

A Chemical Difference between Living and Dead Protoplasm.—From various experiments (chiefly with protoplasm of plants, also with Infusoria) Herren Loew and Bokorny find (*Pflüger's Arch.*) that living protoplasm possesses in an eminent degree the property of reducing the noble metals from solutions, and that this property is lost when death occurs. "It may well be inferred," say the authors, "that the mysterious phenomenon denoted by the name of 'Life' depends essentially on these reducing atom-groups. In the present state of science we explain these 'groups in motion,' these springs of life phenomena, as aldehyde groups, but would by no means exclude some different and better mode of explanation."

Rattlesnake Poison.—Dr. Lacerda Filho has published the results of his experiments on the poison of the rattlesnake (*Crotalus horridus*) in the *Archivos do Museu nacional do Rio de Janeiro*, iii. 1. The poison of *Crotalus horridus* acts upon the blood by destroying the red-blood corpuscles, and by changing the physical and chemical quality of the plasma. 2. The poison contains some mobile bodies similar to the micrococcus of putrefaction. 3. The blood of an animal killed by the snake's bite, when inoculated to another animal of the same size and species, causes the death of the latter within a few hours, under the same symptoms and the same changes of the blood. 4. The poison can be dried and preserved for a long time without losing its specific quality. 5. Alcohol is the best antidote to the poison of *Crotalus horridus* known until now.

The Spermogonia of Aecidiomycetes.—According to recent observations by Prof. Rathay (Vienna Acad. *Anz.*) the spermogonia of Uredineæ or Aecidiomycetes may discharge their contents without the action of external moisture, of rain or dew (the only way, as apparently supposed by A. de Bary). The process may occur in dry and hot sunny weather, and as follows:—These spermogonia produce in their interior not only mucilage and spermatia, but also sugar. In virtue of the latter they separate water by "osmotic action," and this water causes the inclosed mucilage to swell, and thereby afford exit from the cavity. The author's observations were made upon the spermogonia of *Gymnosporangium conicum* and *Puccinia suaveolens*.

Pelagic Fauna of Gulf Stream.—Alexander Agassiz gives an interesting account of his explorations of the floating fauna of the Gulf Stream in the vicinity of the Tortugas. The party remained at this station for some five weeks, being allowed to select quarters at Fort Jefferson. Unfortunately during the greater part of their stay the strong northerly winds interfered greatly with the surface fauna. Had the south-easterly winds prevailed the fauna would have been driven against the Tortugas. The few favourable days showed, however, a wealth of pelagic animals which had been hardly anticipated, and which proved how excellent a station this would be to investigate the fauna from. It also has the immense advantage of supplying the naturalist, and at his very door, with not only the common species of reef-building corals, but with the varied invertebrate fauna to be found in such places. Leaving a full enumeration of the species for another occasion, in the letter we now notice (*Bulletin* of the Mus. Comp. Zoology, vol. ix. No. 3) A. Agassiz mentions in a general way the presence of a couple of species of Firoloidea, of Phyllirhöe, of several Appendiculariæ, of a small Pyrosoma, of a Doliolum, two species of Salpa, and half a dozen species of Pteropods. The number of pelagic foraminifera was greatly disappointing; not once was a species of Globigerina met with, and the Radiolarians appear to have also been scanty. A list of the Ctenophoræ, Discophoræ, Siphonophoræ, and Hydroids met with is appended by Mr. Fewkes. Many of the species are indicated as new.

Retarded Development in Insects.—In a paper by Prof. C. V. Riley, at the recent meeting of the American Association, the author records several interesting cases of retarded development in insects, whether as summer coma or dormancy of a certain portion of a given brood of caterpillars, the belated issuing of certain imagines from the pupa, or the deferred hatching of eggs. One of the most remarkable cases of this last to which he calls attention is the hatching this year of the eggs of the Rocky Mountain Locust or Western Grasshopper (*Caloptenus spretus*) that were laid in 1876 around the Agricultural College at Manhattan, Kans. These eggs were buried some ten inches below the surface in the fall of 1876 in grading the ground around the chemical laboratory, the superincumbent material being clay, old mortar, and bits of stone, and a plank side-walk being laid above this. In removing and regrading the soil last spring Mr. J. D. Graham noticed that the eggs looked sound and fresh, and they readily hatched upon exposure to normal influences, the species being determined by Prof. Riley from specimens submitted by Mr. Graham. Remarkable as the facts are, there can be no question as to their accuracy, so that the eggs actually remained unhatched during nearly four years and a half, or four years longer than is their wont; and this suggests the significant question, How much longer the eggs of this species could, under favouring conditions of dryness and reduced temperature, retain their vitality and power of hatching? Putting all the facts together, Prof. Riley concludes that we are as yet absolutely incapable of offering any satisfactory explanation of the causes which induce exceptional retardation in development among insects. The eggs of Crustaceans, as those of *Apus* and *Cypris*, are known to have the power of resisting drouth for six, ten, or more years without losing vitality, while in some cases they seem actually to require a certain amount of desiccation before they will hatch. Yet the fact remains that different species act differently in this respect. In short, nothing is more patent to the observing naturalist than that species, and even individuals of the same species, or the progeny of one and the same individual, act very differently under like external conditions of existence: in other words, that temperature, moisture, food, &c., influence them differently. Hence, as has been shown by Semper to be the case with other animals, so it is with insects, changes in the external conditions of existence will not affect the fauna as a whole equally, but will act on individuals. We can understand how this great latitude in susceptibility to like conditions may and does, in the case of exceptional seasons, prove beneficial to the species by preserving the exceptional individuals that display the power to resist the unusual change; but we shall find ourselves baffled when we come to seek an explanation of the cause or causes of such retardation, unless we accept certain principles of evolution. In the innate property of organisms to vary, and in the complex phenomena of heredity, we may find a partial explanation of the facts, for the exceptional tendency in the present may be looked upon as a manifestation through atavism of traits which in the past had been more commonly possessed and more essential to the species.

PHYSICAL NOTES

A singular case of the production of sound by natural causes is recorded by M. Reuleaux (*Proc.* of the Nat. Hist. Soc. of Prussian Rhineland and Westphalia). He observed it while hunting in the Röderbacherthal, near the highest point of the Rhine province. The ground is, in the main, gently undulating and densely wooded. The valley, spacious on the eastern side, narrows rapidly at one part to a sort of pass, through which, for about one kilometre, the Röderbach flows westwards. A sout-west wind was blowing, and M. Reuleaux, coming along the hillside from the east, heard what appeared to be the strokes of a fine deep-toned bell in rapid succession. There was no such bell in the neighbourhood, and some other sounds soon heard satisfied him that the effects were of natural origin. Tones were heard growing in force to a maximum, then dying away; they were like those of organ-pipes at first, but their "clang" came to resemble that of a harp or violin. At the mouth of the pass, whence the sounds seemed to radiate, there was a strange agitation in the air, and mixture of sounds, some of which abruptly stopped. M. Reuleaux supposes bodies of air in vortical motion (*trombes*) to have been carried along from the pass, and the sound to have been due to conflict between the outer and the inner air at the mouth of such *trombes*, producing oscillations. There was a marked difference of temperature between

the higher and the lower parts of the valley, and this is regarded as an important factor in the case; the cold air above pressing on the warm below, and closing the pass to a sort of tube. The wind seemed to be active only in the lower parts.

WITH the aid of delicate apparatus of recent invention Herr Grunmach (*Wied. Ann.* No. 9) has investigated the electromagnetic rotation of the plane of polarisation of radiant heat in solid and liquid substances (flint glass, plate glass, sulphide of carbon, oil of turpentine, distilled water, and alcohol). His finding is as follows:—1. In solid as well as in liquid diathermanous bodies there is such rotation, and always in the direction in which the current flows through the spiral or circulates round the magnetic core. 2. The amount of this rotation is, *cæteris paribus*, very different for different substances; the rotation is greater the greater the index of refraction of the substance. 3. With direct action of a galvanic current conducted round the diathermanous body, the amount of the rotation is proportional to the intensity of the current. 4. In a diathermanous body placed between the poles of an electromagnet, the amount of rotation is proportional to the magnetic force acting on the body. 5. The amount of rotation increases with the length of the substance traversed by the rays; but the relation between these two quantities could not be numerically determined.

EXPERIMENTS on heat-conduction have been lately made by M. Christiansen of Copenhagen (*Wied. Ann* No. 9), by the following simple method:—Three round copper plates are placed one above another, separated by small pieces of glass. A hole is bored radially into each plate, and a thermometer bulb inserted in each hole. The lowest plate rests on a brass vessel, through which cold water is conducted, and on the top plate rests a brass vessel with circulation of warm water. Through holes in the two upper plates (supplied with copper stoppers) the intervals between the plates may be filled with liquid. M. Christiansen experimented first with air, and he proves that its heat-conduction increases with the temperature. The ratio of the conductivity of air to those of several liquids was next studied, the liquid being placed in the lower interval. The results agree well with Weber's figures for absolute conductivity. Some experiments were also made with plate glass (dry and wet) and marble. The method may be adapted (the author points out) to measurement of electric resistances, the potential being measured instead of the temperature.

AMONG some interesting experiments with liquid films, described by M. Plateau to the Belgian Academy, is one in which fine iron wire is first bent to represent a six-petalled flower in outline; the circular centre being supported on a small fork stuck in a piece of wood. The wire is slightly oxidised with nitric acid. The flower is dipped in glyceric solution, and is then put under a bell jar near a window, so that the sky is reflected in the films. A pretty play of bright colours is soon observed, and it continues for hours. Again, with regard to explosion of soap bubbles, one is apt to think the whole of the film is converted simultaneously into minute spherules. M. Plateau has formerly shown that it is not so, and has analysed the course of the phenomenon. An experiment proving the contraction of the bubble during its quick destruction is as follows:—A bubble of glyceric liquid about 11 centimetres in diameter is blown with tobacco smoke, and placed on a ring. Having waited till the top appears blue, you break it there with a metallic wire, whereupon the mass of smoke is shot vertically upwards a dozen centimetres, and then spreads out horizontally, in umbrella shape. It then rises more slowly, and is diffused.

PROF. EXNER of Vienna has lately proved that galvanic elements formed of three elementary substances, one of which is bromine or iodine, give perfectly constant action, and that the electromotive forces exactly correspond to the heat values of the chemical processes. There is no trace of polarisation. Bromine and iodine are also shown to be the worst conductors of electricity at present known. Both bromine and iodine conduct entirely without polarisation, (the latter in solid as well as in liquid condition.) The conductivity rises rapidly with the temperature.

CAREFUL experiments by Herr v. Wroblewski on diffusion of liquids (three chloride of sodium solutions and water) are described in *Wied. Ann.* (No. 8), and yield the result that the constant of diffusion (so far as those experiments go) decreases with decrease of the amount of salt, according to a law of simple proportion. The author further tried a photometric method of measuring diffusion, where the proportion of salt is extremely small; using Hüfner's spectrophotometer and (as colouring-matter in water) nigrosin. He cannot claim great exactness for the results, but the constant is at least one place of decimals smaller than the smallest constant of a salt hitherto known.

DR. KALISCHER, who has been experimenting on selenium cells for the photophone, confirms the observations of Adams and Day that light may in certain cases set up in these cells a photo-electromotive force; the cell becoming its own battery. The same experimenter draws attention to a curious point, namely, that the sensitiveness of selenium cells to light is often greater in cells of high resistance than in those in which, by annealing, the resistance has been greatly reduced. A single cell kept for some months gradually lessened in resistance, while becoming less sensitive to light. These anomalies Dr. Kalischer attributes to the allotropic modifications through which the substance passes, the want of homogeneity accounting also for the photo-electromotive forces observed.

AN excellent paper by M. Gariel has appeared in our contemporary, *L'Électricien*, in which the formulæ for the grouping of cells in a voltaic battery, as deducible from Ohm's law, are discussed and represented in graphic diagrams. M. Gariel has thus arrived at a kind of abacus by which the various problems that arise may be geometrically solved by simple inspection.

PROF. LOVERING of Harvard has lately unearthed from the *Memoirs* of the American Academy a paper by Dr. Nathaniel Bowditch of Salem, Mass., communicated in 1815, in which he investigates the figures made by a double pendulum which compounded two vibrations at right angles to one another. This research, which was illustrated by several plates of figures, therefore antedates that of Lissajous, to whom the discovery of these figures is usually accredited, which was published in 1857. Bowditch investigated the cases of the ratios representing unison, the octave, the twelfth, and the double octave. Bowditch was himself inspired to this investigation by a paper written by Prof. Dean of Burlington, Vermont, in which a compound pendulum, identical with that known as Blackburn's pendulum, was used to illustrate the motions of the earth as viewed from the moon. Blackburn's pendulum dates from 1844. Sang, in 1832, used vibrating wires to compound rectangular vibrations; and Wheatstone's kaleidophone dates from 1827.

SELF-LUMINOUS photographs capable of shining in the dark can be made, as Eder has shown, by laying a transparent "positive" upon a sheet of Balmain's luminous paint, and then exposing the latter to sunlight. The photograph thus produced is a "positive" also. It lasts, of course, only for a limited time.

DR. MÜLLER-ERZBACH, who has just made an exhaustive examination of the desiccating powers of different substances, states that there is no perceptible difference between the power of concentrated oil of vitriol, glacial phosphoric acid, and solid caustic potash in this respect, and that caustic soda and chloride of calcium are only slightly inferior, the difference in tension of aqueous vapour between phosphoric anhydride and anhydrous chloride of calcium being a fraction of a millimetre in the barometric column. He also states that caustic soda is absolutely dehydrated by being shut up in a desiccator with caustic potash.

SOLAR PHYSICS

LIEUT.-COL. DONNELLY, R.E., made the following introductory remarks to Prof. Stokes' first Lecture, which was the first of the series:—

I greatly regret both for your sake and my own that I should have to detain you for a few minutes from the lecture which we have all come to hear. It has, however, been considered desirable that some explanation should be given of what has led to the formation of this Committee on Solar Physics, and what has led to the giving of these Lectures. I am glad to say that in engaging your attention for a few minutes I shall not seriously curtail the time that Prof. Stokes will have at his disposal, for he has been good enough to undertake to lecture on Friday in place of General Strachey, who unfortunately cannot give the lecture which has been announced for him.

[1] Introductory Lecture by Prof. Stokes, Sec.R.S., in the South Kensington Museum Theatre on Wednesday, April 6, 1881.